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MONTHLY REPORT - MARCH 1979

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TO OUR READERS:

In the future, to cancel delivery of the Southwest Fisheries Center (SWFC) Monthly Report, or to change the delivery address, please notify by writing:

Editor, Southwest Fisheries Center
P.O. Box 271
La Jolla, California 92038

IZADORE BARRETT, DIRECTOR, SWFC
JOHN F. CARR, DEPUTY DIRECTOR, SWFC

SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - MARCH 1979

STATUS OF PUBLICATIONS

Published

Dizon, Andrew E., Richard W. Brill, and Heeny S.H. Yuen. 1978. Correlations between environment, physiology, and activity and the effects on thermoregulation in skipjack tuna. In Gary D. Sharp and Andrew E. Dizon (editors), The physiological ecology of tunas, p. 233-259. Acad. Press, N.Y.

Dizon, Andrew E., and Gary D. Sharp. 1978. II. Perspectives: The past, present, and future of tuna physiology. In Gary D. Sharp and Andrew E. Dizon (editors), The physiological ecology of tunas, p. 451-458. Acad. Press, N.Y.

Hunter, John R. 1977. Behavior and survival of northern anchovy, Engraulis mordax, larvae. California Cooperative Oceanic Fisheries Investigations 19:138-146.

The object of the review was to provide an understanding of the behavioral factors that determine whether or not larvae of the northern anchovy, Engraulis mordax Girard, will starve. The swimming and feeding behavior of anchovy larvae is described and related to temperature, developmental stage, characteristics of the food and food distribution and to other variables. The principal sources of this information were published and unpublished observations of larvae cultured in the laboratory.

Hunter, John R., John H. Taylor and H. Geoffrey Moser. 1979. Effect of ultraviolet irradiation on eggs and larvae of the northern anchovy, Engraulis mordax, and the Pacific mackerel, Scomber japonicus, during the embryonic stage. Photochemistry and Photobiology, 29:325-338.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Anchovy and mackerel eggs and yolk-sac larvae were exposed to UV radiation in the bioactive band of wave lengths between 280 and 320 nm, the UV-B region of the spectrum. Irradiation levels were based upon predicted UV-B increases that would result from anthropogenic diminution of Earth's protective ozone shell. Dose-response relationships for mortality and histological and morphological effects were determined for two different spectral energy compositions, using FS-40 sunlamps and two filter combinations. Anchovy were more sensitive than mackerel to UV-B. Data for anchovy were analyzed in terms of DNA-effective doses, i.e., the integrated spectral fluence (in $J/m^2/nm$) with the energy at each nm weighted by its effectiveness relative to the Setlow generalized DNA action spectrum. Fifty percent of anchovy survived a cumulative DNA effective dose of 1150 J m^{-2} over a 4-day period. In the surviving larvae, irradiation induced lesions in the brain and eye, caused marked dispersion of pigment within melanophores and retarded growth and development. At the lowest dosage used, 760 $(J\ m^{-2})_{DNA\ eff.}$, growth was retarded and brain lesions occurred in anchovy. Calculations of Smith and Baker (in this issue) indicate that in clear ocean water a significant incidence of lesions and retardation of growth in anchovy could occur at the surface at a 25% reduction in ozone and down to 3.5 m at a 50% reduction. Eggs and larvae of anchovy occur at these depths.

Lasker, Reuben and Paul E. Smith. 1977. Estimation of the effects of environmental variations on the eggs and larvae of the northern anchovy. California Cooperative Oceanic Fisheries Investigations 19:128-137.

Expanded studies of stock and recruitment at the Southwest Fisheries Center have led to additional objectives for laboratory and field work concerning the northern anchovy, Engraulis mordax. In addition to monitoring the stock size of the spawning portion of the anchovy population, we have begun to examine the possible causes and rates of larval mortality.

In this paper we show that the sampling effort required to measure changes in larval survival must be much greater than that used to monitor anchovy spawning biomass, i.e., closer intervals of sampling (in time and space) will be needed over relatively broad areas. Although existing sampling techniques are probably adequate to accomplish this, we show that there still remains the need to refine our statistical methods for analyzing larval age groups, data required for assigning larval mortality rates.

Changes in anchovy spawning are compared to seasonal and annual variations in sea water temperature, vertical temperature gradients, upwelling, California Current speed, flushing rate of the Southern California Bight, and secondary production. It appears that the usual habit of the anchovy to spawn in the southern California area in winter, alters radically in some years. The cause for this is not yet known. Quarterly apparent

mortality rates are assembled for the years of greatest environmental changes in the southern California regions for anchovy eggs and larvae (to 6.25 mm).

New biological information needed for analyzing the causes of anchovy larval mortality has been assembled. For example, first feeding anchovy larvae require abundant food in a narrow size range and of particular species. Gymnodinium splendens, a naked dinoflagellate about 40 m in diameter, supports growth when it occurs in concentrations of 20 or more cells per ml. Tests with laboratory reared larvae have confirmed the existence of suitable strata of larval food organisms in nearshore waters which are associated with chlorophyll maximum layers at 15-30 m depth. Storms were observed to disperse the food organisms until they were too low in number to support larval growth.

Kitchell, James F., William H. Neill, Andrew E. Dizon, and John J. Magnuson. 1978. III. Bioenergetic spectra of skipjack and yellowfin tunas. In Gary D. Sharp and Andrew E. Dizon (editors), The physiological ecology of tunas, p. 357-368. Acad. Press, N.Y.

Sharp, Gary D., and Andrew E. Dizon (editors). 1978. The physiological ecology of tunas. Acad. Press, N.Y., 485 p.

Shultz, Cynthia D., and Bernard M. Ito. 1979. Mercury and selenium in blue marlin, Makaira nigricans, from the Hawaiian Islands. Fish. Bull., U.S. 76(4):872-879.

Vrooman, Andrew M. and Pedro A. Paloma. 1977. Dwarf hake off the coast of Baja California, Mexico. California Cooperative Oceanic Fisheries Investigations 19:67-72.

Dwarf hake found in southern California is compared to Merluccius productus, the common hake found along the western coast of the United States, through morphometric measurements, meristic counts, and the electrophoresis of tissue proteins from the eye lens, vitreous humor, and muscle myogens.

Dwarf hake differs significantly from M. productus or the rarer M. angustimanus.

Approved by Center Director

Barham, Eric. Giant larvacean houses: Observations from deep submersibles. For publication in Science.

Bartoo, Norman W. and Atilio L. Coan. Changes in yield per recruit of yellowfin tuna (Thunnus albacares) under the ICCAT minimum size regulation. For publication in the Fishery Bulletin, U.S.

Brill, Richard W., and Andrew E. Dizon. Red and white muscle fiber activity in swimming skipjack tuna, Katsuwonus pelamis (Linnaeus). For publication in J. Fish. Biol.

Butler, Richard W. and Jacqueline G. Jennings. Radio tracking of dolphins in the eastern tropical Pacific using VHF and HF equipment. For publication in the Proceedings of the Argos Users Conference.

Feder, Howard M., A.J. Paul and James R. Zweifel. Growth and size of the pinkneck clam, Spisula polynyma, in the eastern Bering Sea. For publication in Fishery Bulletin, U.S.

Jennings, Jacqueline G. and Walter F. Gandy. Tracking pelagic dolphins by satellite. For publication in Symposium on Biotelemetry and Radio Tracking papers.

Jennings, Jacqueline G., Walter F. Gandy and Thomas M. Vanselous. Development of a satellite-linked marine mammal transmitter system. For publication in the Proceedings of the Argos Users Conference.

McConaghy, David C. Geographic location of individual pixels. For publication in Remote Sensing of Environment.

Weihs, D. Respiration and depth-control as possible reasons for swimming of yolk-sac larval anchovy (Engraulis mordax). For publication in the Fishery Bulletin, U.S.

Yuen, Heeny S.H. A night handline fishery for tunas in Hawaii. For publication in Mar. Fish. Rev.

Translation

Suisan Sekai. 1978. Slump in skipjack tuna prices dismays Japanese skipjack tuna fishermen. [In Jpn.] Suisan Sekai 27(5):56-57. (Engl. transl. by Tamio Otsu, 1979, 4 p., Transl. No. 32.)

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Investigations Started to Evaluate New Predictive Methods

Dr. Roy Mendelssohn, Operations Research Analyst, and Lisa Katekaru, Computer Aid, have been analyzing the skipjack tuna landings at the Hawaiian Tuna Packers cannery to examine how well certain time series techniques and environmental variables perform in making simple predictions about fish catch. These new methodologies are being examined because the data show highly seasonal and highly autocorrelated effects so that standard least square techniques are not appropriate.

Another purpose of the analysis is to improve techniques to predict the landings, and increase understanding of the major causal influences on fluctuations in catch. This modeling effort is a first step in an integrated bioeconomic study of the landings being performed at the Honolulu Laboratory.

Preliminary analysis of the data shows a marked change from approximately 1973 onwards in the relationship between the total skipjack tuna catch and the relative proportions of the dominant size classes of the catch. Total catch and catch of large fish "tracked" closely up until about 1973; however, no such simple relationship was evident after 1973. Several factors are being explored to explain this change, including increased fishing elsewhere in the Pacific; increased foreign fishing near Hawaii; and changes in the relative prices of the different fish sizes.

Economic Studies on Hawaiian Fisheries Continue

Linda Hudgins, Economist, has been compiling background information on the economics of Hawaiian fisheries which will be reported in two Honolulu Laboratory Administrative Reports. The first report, a survey of the economic literature on Hawaii's fisheries, clearly points out the sometimes contradictory conclusions that have been reached in the past, but also shows that the indicated areas for future research needs are consistent throughout the literature.

The second Administrative Report is on per capita consumption of fish in Hawaii. It has long been said that Hawaiians consume more fish per capita than elsewhere in the nation, but this is the first attempt to quantify that statement. The report also has a first analysis of the role of fish imports in Hawaii, and an initial attempt to determine "equivalent" products for the different type of imports, so that consumption would be based on a uniform measure.

Biology of Spiny Lobsters Studied

Researchers in the Insular Resources Task continued this study of the biology of the spiny lobster, Panulirus marginatus, in the Northwestern Hawaiian Islands (NWHI), reported Richard N. Uchida, Task Leader. Dr. Jeffrey Polovina, Statistician, reviewed the methodologies used by James Uchiyama, Fishery Biologist, in deriving a growth curve for the spiny lobster and suggested alternative methods. At the suggestion of Polovina, Uchiyama reanalyzed the carapace length-frequency distribution of spiny lobster to determine the progression of modes.

Polovina, assisted by Research Assistant Darryl T. Tagami, also began a stock assessment of spiny lobster in the NWHI. He held discussions with Craig McDonald of the University of Hawaii Sea Grant Program, who is studying the population dynamics of spiny lobster around Kure Island.

Research Assistant Victor A. Honda continued a study of fecundity of spiny lobster sampled around Necker Island and Maro Reef. The preliminary analysis showed that fecundity may not be positively related to size after the female spiny lobster attains a length of about 90 mm. Among 15 females examined, fecundity was positively related to carapace length up to a length of 86.3 mm. Above that length, fecundity did not increase with size or even decreased in relation to increased carapace length. Honda indicated that additional samples are needed to describe positively the fecundity-carapace length relationship.

Plans Readied for Forthcoming Research Cruises

Richard Uchida reported that plans are in readiness for the next three cruises of the NOAA research vessel, Townsend Cromwell in waters around Hawaii. Two of the cruises (TC-79-02, March 30-June 4, 1979, and TC-79-03, June 15-August 3, 1979) will involve joint efforts by the Honolulu Laboratory, the Hawaii Division of Fish and Game, and the University of Hawaii Sea Grant Program to study primary and secondary productivity and fishery resources in the nearshore and slope waters of the NWHI. The third cruise (TC-79-04), also a joint effort with other agencies, will involve work in waters of American Samoa and Western Samoa to survey fishery resources and to deploy fish aggregating buoys in the Samoan area.

Research Assistant Robert L. Humphreys, Jr. will be Chief Scientist on Part I of TC-79-02, which will have cooperating scientists from the University of Hawaii Sea Grant Program on board the Townsend Cromwell to do work on primary and secondary productivity. Uchiyama will serve as Chief Scientist on Part II of the cruise which will survey and assess: (1) the wildlife resources and (2) the demersal and pelagic fishery resources over seamounts, banks, reefs, and offshore waters in selected areas in the NWHI.

Samples Collected for Tetraodontidae Poison Study

In cooperation with Dr. Edward P. Ragelis, a biochemist at the U.S. Food and Drug Administration in Washington, D.C. who is conducting a study on tetrodotoxin, a virulent neurotoxin found in puffer. Victor Honda collected tissue samples of the common smooth puffer, Arothron hispidus, from Hawaiian waters, and obtained 38 puffers from the Hawaiian Institute of Marine Biology, University of Hawaii, and from the skipjack tuna boat, Yellowfin. The puffers were weighed and measured and the viscera frozen and airshipped to Ragelis.

Summary of Baitfish Data Prepared

Richard Uchida, assisted by Sally Kuba, Computer Programmer and Research Assistant Ray Sumida prepared a summary of data on fishing effort and catch per effort in the nehu, Stolephorus purpureus, bait fishery in Hawaii from 1973-77. The data were used as background material for a meeting which Uchida attended with representatives from the Hawaii State Water Transportation Facilities Division, Division of Fish and Game, Tuna Boat Owners Cooperative, U.S. Corps of Engineers, and La Marine Sailing Club to review future recreational and commercial uses of Keehi Lagoon, Oahu. Ths lagoon is an important locality for night bait in the local skipjack tuna fishery.

NWHI Fish and Shellfish Catch Data Sumarized

Uchida and Tagami continued to summarize data by months, cruise, type of gear, total catch, fishing effort, and catch per effort for all species of fish and shellfish caught in 6-min latitudinal and longitudinal grids in the NWHI.

Plankton Study Started

Research Assistant Paul M. Shiota began a study of zooplankton distribution and abundance in NWHI waters based on material collected on Townsend Cromwell cruises from May 1977 to March 1978.

Manuscript on Respiration Rates in Skipjack Tuna Revised

Reginald M. Gooding, Fishery Biologist, revised a manuscript, "Respiration rates and low oxygen tolerance limits in skipjack tuna, Katsuwonus pelamis," by Gooding and Neill, following a review of the manuscript by Dr. A. Dizon and Dr. W. Neill, Texas A&M University.

Seabird Diet Study Continues

Thomas S. Hida, Fishery Biologist, continued to identify food items regurgitated by seabirds. Most of the organisms identified in the material examined during the month were common food items, a few new items were large Stolephorus buccaneeri, nehu; a puffer, Lagocephalus lagocephalus; and the fullbeak, Strongylura gigantea.

Training Arrangements for Fishery Training Completed

Hida also made arrangements for a 3-month fishery training program on board two local tuna boats, the Yellowfin and the Buccaneer, for two fishery trainees from Thailand.

Cumulative Landings of Skipjack Tuna Continue Below Long-Term Average

The March 1979 Hawaii landings of skipjack tuna were estimated at 145 metric tons (MT), which is 68 MT above the March 1978 landings and 17 MT above the 1948-78 long-term average for March. The cumulative landings from January through March were estimated at 358 MT, which is 35 MT below the 1978 landings for the same period and 21 MT below the 1948-78 long-term average for the same period.

FISH-ENVIRONMENT INVESTIGATIONS (FEI)

Accelerated Research on Tuna Behavior and Physiology Planned for Summer

During March, members of the Experimental Ecology of Tunas Task spent the majority of their time preparing for the busy summer research period when large tunas are available in greater numbers around Hawaiian waters, reported Andrew E. Dizon, Task Leader.

Randolph K.C. Chang, Fishery Biologist, has been developing a tank system designed to determine oxygen uptake of tropical tunas force-swum at speeds above the minimum necessary to maintain hydrostatic equilibrium. Respiration levels of skipjack tuna at those basal speeds were the subject of an earlier study. In the present study, Chang will force the tunas to swim at elevated speeds by feeding the fish slugs of tungsten, which is an ideal metal since it is 80% heavier than lead and is one of the least reactive of all metals, thus requiring no protective coatings to resist the corrosive action of the fish's digestive system. Increasing density requires a fish to swim faster to maintain hydrostatic equilibrium since these tunas (at least at the size available) have no swim bladders and are negatively buoyant. Faster swimming creates proportionally more lift on the pectoral fins which counteracts the increased density. Measurement of oxygen uptake at these faster speeds is important because it permits accurate determination of energy budgets of wild fish based on estimates of diel activity determined through tracking freely-ranging fish equipped with ultrasonic telemetry devices.

The summer's tracking project will be conducted by Lt.(jg) Howard A. Jemison, NOAA Corps Officer, assisted by Heeny S.H. Yuen, Fishery Biologist, Chang and Dizon. The intent is to fabricate 20 depth-sensitive ultrasonic transmitters and deploy them on relatively large skipjack tuna (70 cm); these are the so-called "season" fish that appear in the fishery every summer. Preliminary tracking experiments revealed that these fish have a characteristic diel activity and depth distribution which will be examined further this summer.

Towards these objectives, a contract will be awarded to the Underwater Telemetry Laboratory (UTL) of the University of New Brunswick for tag design, tag housings, and printed circuit boards. To save labor costs, the tags will be assembled by Task personnel. Dr. Douglas Pincock, Director of UTL, visited Honolulu in March to discuss tag design and to make acoustic noise measurements in the tanks at Kewalo Basin (noisy) and in the area where oceanic tracking experiments will be conducted (reasonable). In addition, some of the new swim speed sensors that were developed in New Brunswick for use on the three-function tag developed for the Southwest Fisheries Center were tested. These tags will measure two different temperatures (body and water) and swim speed.

One of the uses for the three-function tag will be to monitor activity and body temperature of tunas that are behaviorally thermoregulating in the new temperature preference tank being developed at Kewalo Basin. Dizon and Martina Queenth, Research Assistant, are currently testing the tank; if all goes well, measurements will begin at the end of April.

Feasibility of Inducing Spawning in Captive Tuna Studied

Dr. Dizon reported that Dr. Calvin Kaya, visiting scientist from Montana State University, continued work on experiments to induce spawning in captive tuna. Kawakawa in tanks D and E were biopsied on March 13 and 20, respectively, to determine their gonadal maturation states. Those in tank D had been originally captured on January 25, 1979 and, therefore, had been in captivitiy for about 6.5 wk, while those in tank E had been captured on February 14 and had been in captivity for about 5 wk. Of the 20 fish in tank D, 11 were biopsied before the exercise was terminated by equipment failure. Catheterized from these 11 fish were small amounts of viscous milt from 4 males, ovarian tissue from 4 females, and no identifiable material from 3 (probably immature males). The four confirmed females were all immature; the mean diameters of the largest size-class of ova in the samples ranged from 0.09 to 0.12 mm (mean of means, 0.11 mm). One specimen was lost to accidental mortality during the biopsies, while another, in advanced stage of "puffy snout," was sacrificed for further handling and injection trials. The biopsies of those in tank E were conducted much more effectively because of modifications in the capture equipment and because of the experience acquired on the previous exercise. All 19 fish were successfully biopsied; small amounts of viscous milt were obtained from 4 males, ovarian tissue from 12 females, and no identifiable material from 3 (probably immature males). Again all the females were immature, the mean diameters of the largest size-class of ova in the samples ranging from 0.11 to 0.25 mm (mean of means, 0.14 mm).

LA JOLLA LABORATORY

COASTAL FISHERIES RESOURCES DIVISION

ALBACORE FISHERIES INVESTIGATIONS

Combined Ocean Front Survey and Vertical Longline Operation Proposed for Albacore Cruise

R. Lynn, Oceanographer, has proposed a combination ocean front survey and vertical longline operation for the albacore/oceanography survey aboard the R/V Jordan in November 1979. The primary objective will be to test the hypothesis on the migration of albacore formulated from earlier studies (Laurs and Lynn, 1977), that there are two separate groups of albacore following different migration patterns. Albacore taken off the Pacific Northwest and those taken off central and southern California appear to enter the fishery from offshore regions divided approximately near latitude 35° N and have different modes in size composition. In studying more recent tag recovery data, Dr. R.M. Laurs has expanded this hypothesis to state that there appears to be a migration pattern between the Pacific Northwest coastal fishery and the Japanese bait fisheries, and a separate pattern between the California region and a broad central Pacific region north and northeast of Hawaii. Eleven albacore tags recovered in the Japanese longline fishery have been taken in the vicinity of 32° N, the mean latitude of the subtropic front, between 180° and 140° W. Preliminary cruise plans call for an oceanographic survey of the subtropic front to strategically locate regions expected to be favorable to catching albacore. Historical data (ships-of-opportunity XBT sections) show that in November the temperature range preferred by albacore occurs as a thick layer south of the subtropic front and beneath a very warm surface layer. Vertical longlines will be set to sample in and about these regions.

The subtropic front has become a subject of intense interest by several academic institutions. Lynn participated in a conference on this topic as reported in the December issue of this Monthly Report. Lynn and Laurs are evaluating proposals from two scientists of the Scripps Institution of Oceanography for participation on this survey. The proposed SIO work on marine chemistry and oceanography would be complementary to the SWFC's work and could be easily coordinated with the cruise planned operations.

Laurs successfully bid for 16 days of ship time for operations in the eastern North Pacific, using the NOAA research vessel, Surveyor. The ship was made available because of rescheduling. The time frame in September coincides with operations, in the same area, of jig vessels scouting for albacore on charter to the American Fishermen's Research Foundation and in cooperation with SWFC programs. Laurs has outlined a survey track of STD stations and trolling operations that will complement the fish scouting and also will act as a precursor to the November Jordan survey. STD transects will be made across the Transition Zone and ocean fronts that will be repeated in November.

Combined with the June transects of past years and a survey planned for next January by other institutions, the important season cycles in the frontal system will be evident.

Fishery Biologist Trained in Reading of Tuna Otoliths

R. Nishimoto, Fishery Biologist, received training in the preparation, mounting and reading of tuna otoliths from T. Foreman and A. Wild of the Inter-American Tropical Tuna Commission and began examining otoliths of tetracycline-injected albacore. The Albacore Fisheries Investigation group, as reported in September 1978 issue of the SWFC Monthly Report, is conducting a special study to determine rates of "growth ring" formation on otoliths of tetracycline-injected albacore. A total of 2544 albacore were injected with tetracycline, tagged and released in this study and 84 have now been recovered. Of the 84 recoveries, otoliths and dates of recovery for 68 albacore have been collected and 56 of the otoliths have been read.

LARVAL FISHES, COASTAL EAST PACIFIC

Work Completed on Metabolism of Pacific Mackerel Larvae

Dr. John Hunter reports that he and his assistant Carol Kimbrell have completed work on the ration, gross growth efficiency, and metabolism of Pacific mackerel larvae, age 3-5 days. They found that mackerel larvae (age 3-5 days) actively fed throughout the day, filled their guts within the first hour of feeding and remained full throughout the rest of the 12-hour feeding day, despite a high rate of gastric evacuation. Measurements of evacuation rates indicated that about half the gut contents was lost in 2 hours. To grow at 19° C, mackerel larvae consumed, on the average, about 87% of their body weight per day, or about 165-538 of the rotifer, Brachionus, per day. This estimate of ration was based on the dry weight of the mean number of Brachionus in stomachs, adjusted for the rate of evacuation. The mean gross growth efficiency in dry weight was 33% and falls within the range of estimates for fish larvae and young fishes.

Their respiration experiments indicated that mackerel larvae at 18.0° C consumed 6.1 + 1.4 (+ 2X SE of x) liters O_2 $mg^{-1}h^{-1}$. This metabolic expenditure, converted to calories per day was, on the average, about 18% of the mean daily ration. This is probably an underestimate of the metabolic requirement of these larvae because the activity of larvae confined in Warburg respirometry flasks was probably less than that of free-swimming larvae. However, these respiration measurements do establish a lower limit to food ration because the ration would have to exceed the metabolic requirement just to meet maintenance costs. These respiration measurements are above those for most other larval fishes which is in keeping with the high level of activity displayed by mackerel larvae.

Sensitivity of Morphological Method for Classifying Larvae Condition Examined

A critical period for survival of larval marine fish is believed to occur around the time of first feeding. Therefore, starvation may be one of the principal causes of larval mortality. Fishery scientists could probably make a better prediction of recruitment if they could recognize starving larvae easily in ichthyoplankton survey collections.

Fishery Biologist Gail Theilacker has been developing morphological methods that can be used to identify condition of field-collected jack mackerel larvae; that is, whether a larva is feeding or starving. Measuring larval body parts is relatively easy. If it can be shown that differences in the size of the body parts is sensitive enough to indicate larval fish condition, the technique could be applied routinely to assess fish condition in larval fish surveys.

To examine the sensitivity of the morphological method she developed, Theilacker used the measurements obtained to classify larvae of known feeding history and applied them in two independent experiments on other larvae to predict their probable feeding history. After this determination each larva was examined histologically to evaluate the classification of condition by the morphological method. (A histological examination verifies the actual condition of a larva.)

Jack mackerel larvae from the two independent experiments were reared on 1) low density wild plankton (1 copepod nauplius or copepodite per ml) and 2) low density rotifers (6-12 per ml). Correspondence of the classification of individual larval condition by both histological and morphological techniques was good. Ninety-one percent of the larvae fed wild plankton and 85% of the larvae fed rotifers were similarly classified by both techniques. Therefore, it was concluded that the morphological technique allows reasonable estimates of condition of jack mackerel larvae. This is important because morphological parameters are easier to measure than histological ones and routine measurements of larval fish body parts could be incorporated into ichthyoplankton studies.

Work Resumed on Description of Organ Development in the Northern Anchovy

Dr. Charles O'Connell, Fishery Biologist, reported resumption of work on a description of organogenesis in the northern anchovy. Descriptions of development relative to age and length have been largely completed for several organ systems, such as the eye, the olfactory organs, the digestive tract and its derivatives, and the musculature. In addition to the detailed descriptions, significant changes and advances in the various systems will be summarized in a chronological table for quick reference to overall state of development at any age. However, certain critical points of development in some systems are not yet clearly understood. Among them are the actual process and precise timing of rod development in the eye, and hence the advent of dim light visual capability, and also the question of how early the olfactory sense becomes functional. A limited program of electron microscopy has been undertaken to resolve these and a few other problems.

Estimate of Spawning Batch Fecundity for Anchovy Completed

Bob Soloman, Biological Technician, completed an estimate of spawning batch fecundity for anchovy taken during the February 1979 gonad/egg survey. The estimation technique, based on the number of hydrated eggs in an ovary, is described in a paper by Drs. Hunter and Goldberg. In February 1979 the numbers of hydrated eggs per gram of female weight (less ovary) was 444 + 57 (+ 2X SW of x) (n=32), whereas in Feburary 1978, it was estimated to be 389 + 59 (n=23). The two estimates are relatively close; two standard error units for these means broadly overlap. Thus the spawning batch fecundity of northern anchovy central subpopulation has not changed significantly from last year. The mean for the 2 years, 416 eggs/g female (less ovary), was nearly the same as that calculated from the most mature eggs (non-hydrated) in the ovary in February 1978, i.e., 418 eggs/g. It appears that the central subpopulation of northern anchovy releases about 400 eggs/g body weight at each spawning.

These estimates will be used to calculate the spawning biomass of anchovy using the new direct estimation technique developed last year.

Options Added to Prey Ingestion Model

Dr. Daniel Weihs who is the Southwest Fisheries Center, NOAA Research Associate for 1979, continued work on the prey ingestion model described earlier.

This month Dr. Weih's paper, "Energetic significance of changes in swimming modes during growth of larval anchovy," (see Monthly Report of September 1978) was accepted for publication in Fishery Bulletin. He also completed and submitted a second paper, "Respiration and depth control as possible reasons for swimming of yolk-sac larval anchovy," (Monthly Report of November 1978) to the Fishery Bulletin. An abstract of this latter paper, in poster form, will be present at the Early Life History of Fish Symposium at Woods Hole, April 2-5.

Draft Manuscript Completed on Relation Between Zooplankton on Predators and Anchovy Larvae

Dr. Angeles Alvariño completed a draft of a manuscript on the relation between zooplankton predators and anchovy larvae, which will be given in a poster session at the ICES Symposium on the Early Life History of Fish to be held in Woods Hole, Massachusetts, April 2-5, 1979. She is also compiling a bibliography and pertinent notes for a chapter on the reproduction of Chaetognatha.

Microscale Variations of Phyto and Microzooplankton Exhibited in Sampler Casts

In March, Dr. Robert Owen, Oceanographer, completed counts of organisms from two micropatch sampler casts, obtained off Peru. Both exhibited significant microscale variations of phytoplankton and microzooplankton, some suitable as food for larval anchovetta. One of these sample sets was obtained in the upper mixed layer under winds exceeding 10 m/sec, indicating that microstructure persists even when vertical mixing is in progress.

Further work was done by Lee Inness-Brown on the new micropatch sampler to enable Owen to sample fine-structure of the fraction of larval fish food not well-represented by the small-volume samples obtained to date.

Owen also prepared a paper, "Microscale plankton patchiness and feeding of larval anchovy," for presentation at ICES Symposium on the Early Life History of Fish in Woods Hole, April 2-5, 1979.

Work Resumes on Determination of Birthdate Distribution of 1978 Anchovy

Work on determining the birthdate distribution of the 1978 anchovy year class resumed with the hiring of a new laboratory assistant, Susan Longinotti. Recently Rick Methot and Longinotti processed a sample which was collected February 5, 1979 near the mouth of San Diego Harbor. Twenty-one fish ranging in length from 75 mm to 95 mm had birthdates between mid-March 1978 and the end of April. This birthdate distribution is very similar to the distribution of birthdates of anchovy collected near San Diego in September and October 1978.

The growth rate during the October-February period was slow, and mean size increased from 78 mm to only 82 mm. This slow growth rate is also evident when the size of the increments near the edge of the otolith is examined. In October, the anchovy were depositing increments 3-5 m in width. The February fish had approximately 100 smaller, 1-2 m, increments in the outer region of their otoliths. Methot plans to continue monitoring outer increment size into the spring to determine the time at which growth accelerates.

MULTISPECIES TAXONOMY

Multispecies Taxonomy Staff Continues Varied Research Studies on Larval Fish

Drs. Ahlstrom and Moser spent part of the month preparing a talk to be given at the Early Life History of Fish Symposium at Woods Hole in April; all members of the program assisted in the preparation. Barbara Sumida-MacCall received the galley and page proof of a paper co-authored with Ahlstrom and Moser on the larvae of turbots and related species. Elaine Sandknop and Barbara MacCall were on duty as technicians on the David Starr Jordan Cruise 7904. Betsy Stevens worked on a manuscript on the larval development of the blenny genus, Hypsoblennius, based on a series reared in the aquarium.

The identification of CalCOFI samples from 1978 continued with John Butler, Susan D'Vincent, Elaine Sandknop and Betsy Stevens each working on a cruise. A preliminary hierarchical list of species was completed by Dr. Moser in collaboration with Dr. Paul Smith and Cindy Haight. Ultimately, the code will be used in entering egg and larval identification data directly onto the computer via the terminal in Dr. Smith's laboratory. Rich Charter and Butch Burris completed entry of the 1975 unsized egg and larval data into the computer system and Rich worked on plotting routines for data presentation. John Butler, with the help of Morgan Busby and the other members of the Multispecies Taxonomy Program, has reared a series of white croaker, Genyonemus lineatus, collected on February 23 through to metamorphosis, while croaker and queenfish (Seriphus politus) eggs collected on March 15 are being reared at 12, 16 and 20° C. Preliminary results indicate low survival for Seriphus at 12° C and for Genyonemus at 20° C. Growth rates for Genyonumus at 12° C are very slow; nine days were required for eye pigmentation and feeding began on day 10.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Second Draft of Jack Mackerel Fishery Management Plan Presented to Council

Alec MacCall (CF&G) presented the second draft of the Jack Mackerel Fishery Management Plan (FMP) to the Pacific Fishery Management Council (PFMC) on March 9 in Eureka. The Jack Mackerel Plan is to proceed in parallel with the groundfish FMP and because the latter was postponed for two months, the jack mackerel FMP was similarly postponed. This opportunity is being used to produce a "finished" third draft. The Council's Scientific and Statistical Committee (SSC) appointed a subcommittee to review the jack mackerel FMP, and their suggestions are being included in the third draft. The third draft will be considered by the Council at their May meeting.

Dr. Daniel Huppert presented the revised amendment to the Anchovy Plan for 1979 to the PFMC at the March meeting also. In response to the Council's desire for a formula or range for domestic annual harvest of anchovies, the revised amendment makes domestic harvest equal to optimum yield (which is defined as a function of estimated biomass) or domestic capacity, whichever is smaller. The Council approved the new version, but will wait until after a new public comment period for a final approval.

Study Suggests that Sardines May Retard Growth of Anchovies

A. MacCall examined the widths of anchovy scales deposited in anaerobic sediments in the Santa Barbara basin. Some of this work was done several years ago, but was not published. The data were exhumed, reanalyzed, and a manuscript is partially completed. The reanalysis consists of comparing scale width distributions with respect to ecosystem states, using non-parametric methods. The anchovy scale width distribution was essentially the same for conditions of high and low anchovy scale deposition rate. However, the anchovy scales were significantly smaller for conditions of high sardine deposition rate as compared with conditions of low sardine scale deposition rate. This is consistent with a hypothesis that adult sardines compete with adult anchovies for the same food supply.

The difference in anchovy weight is presumably proportional to the cube of the mean scale width. This indicates that anchovies are 50% heavier when sardines are scarce. Numerical anchovy abundance, as indicated by scale deposition rate, is only slightly higher when sardines are scarce. The above relationship suggests that if sardines were to recover to a substantial level of abundance, a decrease in anchovy biomass may be expected because of decreased size rather than decreased numbers. Unfortunately, it does not appear that this hypothesis will be testable in the foreseeable future.

Documentation for Aerial Marine Resources Monitoring System (AMRMS) Completed

Joe Caruso, Mathematician, reports that the documentation for the AMRMS computer data base was completed this month. The 150+ page document covers the entire system from the coding of the data to its retrieval after it is on the data bases. Included in the report are some historical background, a system overview, a coding instruction manual, computer program execution instructions, listings of the programs and error messages, data base record constructions and numerous practical examples in appropriate sections.

Annual U.S.-U.S.S.R. Cooperative Egg and Larva Survey Completed

Dr. Gary Stauffer reported that the annual U.S.-U.S.S.R. cooperative egg and larva survey using the Soviet research vessel, Tikhookeanskiy, was completed on March 5, 1979. Of the 130 planned CalCOFI stations, only the 83 stations in U.S. waters were occupied. The 10-meter water temperature averaged 12.88° C for the 83 occupied stations, approximately 2° C lower than 1978 temperatures for the same area. Shipboard scans of the plankton samples for the presence of hake eggs and larvae found 22.9% and 53.0% positive samples for eggs and larvae, respectively. Preliminary estimates for number of larvae per tow was 36.4. This compares with similar numbers of 32.6 and 42.9 larvae per tow for 1977 and 1978, respectively. Although spawning at this time was generally south of Pt. Conception, unlike the previous 2 years, hake spawning in 1979 was on a par with 1977 and 1978. Preliminary results obtained on the Discoverer cruise 2 weeks later supports these conclusions on the magnitude of hake spawning, although a considerable increase in hake larvae was found north of Pt. Conception.

With respect to shipboard scans for anchovy eggs and larvae, the 83 samples showed 15.7% and 39.8% of the stations were positive for eggs and larvae, respectively. This compares to 15.2% and 34.2% for the 1978 Ogon survey and 6.4% and 26.9% for the 1977 Ogon survey. The preliminary estimate of the mean number of larvae per stations was 43.6. This compares to the preliminary results for the 1978 and 1977 Ogon surveys of 38.4 larvae (134.6% of 28.5 larvae) and 43.1 larvae (143.6% of 32.0 larvae), respectively. The nearshore distribution of anchovy larvae is quite similar to that of the previous 2 years. Preliminary results of the Discoverer cruise found anchovy larvae further offshore and considerable spawning south of the border, unlike 1978.

U.S.-Spain Cooperative Squid Survey Terminated

Dr. Gary Stauffer, Fishery Biologist, reported that the U.S.-Spain cooperative squid survey using the Spanish F/V Freire-Lopez was terminated on March 9 in Eureka after 21 days (see also report of the Tiburon Laboratory). All planned areas fishable with semi-pelagic gear were surveyed. Squid were never encountered in midwater or near the bottom. Sixty-seven trawl stations were occupied. The Spanish semi-pelagic trawl was fished 59 times of which 52 were successfully deployed. The pelagic trawl was fished 8 times, but the deployment was ineffective in all cases. Squid were taken in 34 of the 52 stations. A total of 89.3 metric tons of fish were caught during the survey; this included 1.05 metric ton of squid, Loligo opalescens.

In southern California 0.12 MT of squid was caught. A total of 0.23 MT were taken in central California, and 0.70 MT were caught in northern California. The largest catches of squid were made offshore of Crescent City.

The Spaniards retained 18.5 MT of by-catch onboard. This consisted of 15.5 MT of rockfish, primarily bocaccio, chilipepper and widow rockfish, 1.0 MT of hake, 0.7 MT of sablefish, 0.3 MT of flatfish and 1.0 MT of squid.

A series of biological samples of shortbelly rockfish was collected for Dr. William Lenarz of the NMFS Laboratory at Tiburon. These will provide basic data for ongoing population studies for this resource which has been identified as underutilized.

Population Assessment Methods for Anchovy Investigated

Keith Parker, Statistician, has completed draft reports on four investigations aimed at developing alternative methods of anchovy stock assessment. These are: 1) estimating spawning biomass from age composition data, 2) direct estimation of spawning frequency and biomass from spawning products, 3) anchovy vessel logbook data files, and 4) preliminary report on the status of the aerial survey analysis. These reports summarize work which Parker has been doing over the last year. The second paper suggests that this method will develop into a useful biomass estimation method.

Keith Parker will resign his position in April.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION PROGRAM

New Anchovy Egg Sampler Field-Tested

Thus far, 562 samples taken aboard the merchant vessel, Scorpius, under contract to the Coastal Fisheries Resources Division in February, have been analyzed for total anchovy eggs. The samples are part of a proposed alternate method for estimating anchovy biomass under development this past year. The aim is to implement this method by 1982 so that it may be used by management for setting catch quotas, acording to Paul Smith.

Currently, anchovy quotas are set by approximate methods derived from a long time series and anchovy larval abundance, which requires about 5 months of ship time each year to integrate the area under a seasonal spawning curve. The chief advantages of the new method are: 1) it yields an instantaneous estimate of egg production and spawning biomass requiring a single cruise with one or two ships, and 2) each factor in the biomass estimate is formally derived with estimates of precision. The major disadvantage of the new method is that eggs are patchier and represent a shorter time period than larvae. This requires numerous samples to improve precision. A requirement is that each sample should be small to limit sorting time and each station should be sampled more than once to detect the geographic edge of the spawning area.

Of the samples analyzed thus far the overall mean is 9 eggs per sample, corresponding to about 180 eggs per 10 m^2 of sea surface area. The coefficient of variation is less than 2. The range of sample size is from 0 (37% of all samples) to 140 eggs per sample. This is equivalent to 28,000 eggs per 10 m^2. The overall distribution of sample sizes is well described by the negative binomial distribution with a mean of 9 and a constant of 0.3.

The picture below shows the operation of the vertical tow net aboard the NOAA research vessel Discoverer earlier this month. The net tow takes about 2-1/2 minutes to conduct. Eight are conducted each station. The photo was taken by Chief Survey Technician Larry Murray and shows (left) Survey Technicians Andy Beach recording data and (right) Survey Aid Margaret McCracken launching and retrieving the net. The computer code name for the net is CalVET (CalCOFI Vertical Egg Tow). The net, net tow, and survey was designed by Dr. Paul E. Smith. This approach to biomass estimation was formualted by Dr. John Hunter, Dr. Geoffrey Moser and Statistician Keith Parker and Mathematician James Zweifel.

TUNA RESOURCES PROGRAM

American Tuna Fisheries Statistics Reported to ICCAT

Preliminary 1978 statistics on the American fisheries for tropical and temperate tunas in the Atlantic Ocean have been reported to the International Commission for the Conservation of Atlantic Tunas (ICCAT) in Madrid, Spain. The U.S. is a founding member of ICCAT. Atilio L. Coan, Mathematician, reports that these statistics, prepared with the assistance of Ronald G. Rinaldo, Fishery Biologist, and Robert Nydam, Computer Technician, include data on catch, catch and effort, and length frequencies of the catch for the American Atlantic tuna fleet. According to preliminary statistics, 27 American tuna vessels fished in the Atlantic in 1978, catching 21,225 metric tons (MT) of tuna and tuna-like species. The predominant species caught were yellowfin tuna (Thunnus albacares), 9,902 MT and skipjack tuna (Katsuwonus pelamis), 8,429 MT. Included in the report were tables for each of the major species showing catch and fishing effort by ICCAT area, by month, and by 1° to 5° squares for the eastern, midwestern, and northwestern Atlantic. Length-frequency of the American catch was reported in tabular form as determined by area and month from 26 samples of yellowfin tuna, 29 samples of skipjack tuna, and 6 samples of bigeye tuna.

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Length-frequencies of Atlantic tunas from foreign transshipments of catches into Puerto Rico were sampled during 1978 by Eugene Holzapfel, Biological Technician. Species composition of the catch was recorded and 146 samples, 7,246 fish, were collected to determine the length-frequency of yellowfin tuna (51 samples), skipjack tuna (49 samples), bigeye tuna (39 samples) and albacore (7 samples). These data were reported in tabular form by year and quarter.

North Pacific Albacore Data Prepared

Dr. Norman Bartoo, Leader of Temperate Tuna Assessments, and Earl Weber, Fishery Biologist, have completed the process of gathering and summarizing available data to create a data base on catch effort and length-frequencies from the north Pacific albacore fisheries. Total catch and age-frequencies for each fishery exploiting the North Pacific albacore have been estimated by quarter-year time-steps for the years 1952 through 1976. These age-frequencies are the basis for further analysis, which will be conducted on the condition of the stock.

Biological Sampling of Foreign Imports of Atantic Tunas Continues in Puerto Rico

Biological Technician Eugene Holzapfel, stationed in Puerto Rico, reports that biological sampling of foreign-caught Atlantic tunas transshipped to the ports of Mayaguez and Ponce, Puerto Rico, continues in 1979. Results of the sampling compiled by James Renner, Fishery Biologist at the La Jolla Laboratory, for the period January 1 through March 23, 1979 is as follows:

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	14	1017	577
	Purse Seine	5	212	1878
	Unknown	1	50	106
Skipjack	Baitboat	8	417	890
	Purse Seine	10	504	2882
	Unknown(LL)	1	60	129
Bigeye	Baitboat	12	486	130
	Purse Seine	2	72	276
	Unknown	2	125	267
Albacore	Longline	5	250	1020
TOTAL		60	3193	8155

MARINE MAMMAL BIOLOGY & TECHNOLOGY PROGRAM

Data Needs for Marine Mammal Salvage Program Discussed

Dr. William F. Perrin, Leader, Marine Mammal Biology and Technology Program, chaired a meeting February 28-March 1 at the SWFC to discuss the structure of a proposed marine mammal salvage program with researchers in the local area. Through the proposed program all beached and stranded marine mammals would be collected so that maximum scientific use can be made of each specimen. The discussion centered on the research needs of participants and the disposition of the data once collected. The meeting was attended by representative of Hubbs-Sea World Research Institute, Sea World, Naval Ocean Systems Center, the Autonomous University of Ensenada, and the Southwest Regional Office, NMFS.

Cooperative Research on the Dall's Porpoise Problem to Continue

Acting as a member of the International North Pacific Fisheries Commission's Scientific Subcommittee dealing with the involvement of the Dall's porpoise, Phocoenoides dalli, in the Japanese salmon gillnet fishery in

the U.S. Fisheries Management Zone off Alaska, Dr. William Perrin attended a committee meeting at the Ministry of Foreign Affairs in Tokyo March 5-8 to continue cooperative research planning that was begun in April 1978. The incidental kill of Dall's porpoise in the gillnet fishery was estimated by the Japanese to be approximately 800 in 1978, but the Committee recommended further analysis. The main features of the agreement reached at the meeting were the continuation of the program begun last year of placement of U.S. scientists on commercial salmon motherships and salmon research vessels and an agreement by the Japanese to provide a "dedicated vessel" for further research on the problem.

Contract for a Computer Simulation of Purse Seine Dynamics Awarded

Fishery Biologist Jim Coe, Leader of the Marine Mammal Technology Project, reports that on March 22 Science Applications, Inc. (SAI) was awarded a $62K continuation of a contract to develop a computer simulation of the tuna purse seining process. The initial phase of the contract was for the development of the mathematical components and theory necessary to describe the fishing process. After an extensive review of the report from this development work, including a seminar by the SAI principal investigator Dr. Thomas Delmer, the contract is being extended to integrate the component mathematical functions and develop the computer code for the simulation. When complete, the computer simulation will be used as a relatively inexpensive analytical tool to improve gear efficiency and reduce porpoise mortality. The National Fisheries Engineering Laboratory at Bay St. Louis, Mississippi is providing a systems engineer to consult with SWFC and SAI during the period of this contract.

Hawaiian Spinner Behavior to be Studied

Dr. Warren Stuntz, Leader of the Marine Mammal Behavior and Physiology Project, reports that the contract with UC Santa Cruz and Dr. Ken Norris, becomes effective on March 26, 1979. This contract has been let for a study of Hawaiian spinner dolphin behavior and will concentrate mainly on school structure and the behavioral and environmental factors which tend to maintain or disperse schools. The goal is to develop an understanding of the potential impacts that may occur when schools are disrupted by tuna fishing in the eastern tropical Pacific.

Tagging Program Results Reported at Two Conferences

Jackie Jennings, Leader of the Porpoise Tagging Project, traveled to Europe to present the results of recent radio tracking aboard the seiner M/V Queen Mary and to report on the progess of development of a satellite-linked tracking system. At the International Conference on Telemetry and Radio Tracking in Biology and Medicine in Oxford, England, March 20-22, Jennings presented a poster paper co-authored with Richard Butler, Fisheries Methods and Equipment Specialist, entitled, "Radio tracking of dolphins in the eastern tropical Pacific using VHF and HF equipment." The following week (3/25-3/28),

she attended the Argos Data Processing and Utilization Conference in Toulouse, France and presented a paper entitled, "Development of a satellite-linked marine mammal transmitter system," which she co-authored with Walter F. Gandy and Thomas M. Vanselous of NFEL. The Argos satellite system is jointly sponsored by NASA, NOAA and the French Centre Nationale d'Etudes Spatiales and may be used as a basis for future satellite tracking of marine mammals.

Data Base for Porpoise Tag Returns and Resightings Established

Ray Stives, Biological Technician in the Porpoise Tagging Project, reports that the dorsal fin disk tags released in September and October 1978 during Cruise IV of the Dedicated Vessel, Queen Mary, have again been sighted by NMFS observers now returning from the first cruises of 1979. Forty-two (42) sightings have been reported and there have been 3 actual tag returns. The tags were coded by color and geometric design as well as by serial number so that the resighted tags, if described, are of use in distribution and migration studies. A computer data base has been created to store the tag release and resight/recapture data as it comes in throughout the year.

MARINE MAMMAL ASSESSMENT AND MONITORING PROGRAM

Weekly Estimates of Porpoise Kill Started for 1979 Tuna Fishery Season

Weekly estimates of porpoise kill based on radio reports from tuna vessel observers were initiated this month. Estimates are made on the basis of the average number of porpoise killed per day for those vessels carrying observers. These averages are extrapolated to the whole fleet actually fishing. As of March 25 the total mortality was 4150, and the quota for the Northern Common Dolphin was estimated to be exceeded. The average kill per set was 2.76 and the kill per ton of tuna was 0.20. An apparent inconsistency in the estimates of the kill of this stock in 1977 was investigated by Bruce Wahlen, Statistician. In that year the total estimated kill based on the kill per day used in the weekly monitoring was greatly different than the estimate based on the kill per set which was made at the end of the season. The discrepancy does not appear to be due to errors in calculation or in the data. Rather, it appears to be a result of the different estimation procedures.

Historical Porpoise Population Size

Dr. Tim Smith and Tom Polacheck recently published a paper, "Analysis of a Simple Model for Estimating Historical Population Sizes" (Fish. Bull. 76(4):771-779), reporting on a study on the statistical behavior of an estimation technique first discussed in the 1974 report, "The Porpoise-Tuna Problem: Review of Research Progress (Draft Title)", and developed more completely in the 1976, "Report of the Workshop on Stock Assessment of Porpoises Involved in the Eastern Tropical Pacific Yellowfin Tuna Fishery," (SWFC Admin. Report LJ-76-29). They report that the model is rather better behaved statistically than might be expected, primarily because the net rate of increase is small enough to make the calculations nearly linear.

Tom Polacheck, currently a Ph.D. student in the Department of Biology at the University of Oregon, is a temporary employee of the SWFC and is working with Smith on some further statistical problems associated with assessing the status of the stocks. Their current emphasis is on Monte Carlo studies to determine the sampling distribution of estimates of historical abundance of porpoise populations, and of the ratio of current estimates to historical estimates.

Effectiveness of Porpoise Release Regulations Analyzed

Drs. Nancy Lo and Joseph Powers completed a major statistical analysis of the effectiveness of porpoise rescue procedures on reducing the incidental kill of porpoise, at the request of the Southwest Regional Office.

The data from 1975 to 1978 were analyzed using a variety of statistical techniques. The principle conclusions are:

- Two or more men rescuing porpoise during backdown reduced the incidental mortality rate.

- Use of a mask and snorkel by the rescuers significantly reduced mortality.

- Two or more manned speedboats in the water prior to backdown resulted in a significantly lower mortality; two or more appeared to perform more efficiently than a single boat.

- Use of spotlights and floodlights during sundown sets did not result in significantly different mortalitites than when they were not used. However, the sample size is small.

Research Vessel Survey of Porpoise Completed

In 1979 the ship portion of the porpoise survey was completed by the NOAA research vessels, David Starr Jordan and Townsend Cromwell in mid-March. Sixty days were spent by each vessel in one area off Central America in an attempt to calibrate the sighting efficiencies between the two vessels and an airplane currently completing its survey. The two vessels recorded a total of 703 mammal sightings. Very rough weather was encountered in the central Pacific and equatorial waters were unseasonably cool in early 1979.

OCEAN CLIMATOLOGY AND MONITORING

Several Million Sea Surface Temperature Observations Summarized

Dr. Douglas McLain has completed summarization of several million observations of sea surface temperature (SST) made by ships of opportunity during 1971 to 1978. These data have been averaged by 1 degree squares of longitude and latitude and month for the entire globe. The means are based on a global file of ship's weather observations received in real-time by Fleet Numerical Weather Central. The mean values were computed by PEG for use, in cooperation with the NMFS Atlantic Environmental Group, in preparing annual reports on marine environmental conditions in U.S. coastal waters. Global mean values were made because the basic input data covered the entire globe and because PEG often gets requests for SST data in various areas of the world. Some of the requests for SST data are described as follows:

Dr. Paul Smith of SWFC uses the difference between the mean monthly SST of an inshore and an offshore 1-degree square in the Southern California Bight as an index of water mixing and upwelling.

Forrest Miller of IATTC uses mean SST values from the Eastern Tropical Pacific Ocean in preparing monthly SST anomaly maps for the monthly publication Fishing Information.

Paul Wild of California Department of Fish and Game uses mean SST data off central California to try to understand changes in the survival and abundance of Dungeness crab. It appears that survival of eggs carried by adult females is better at low temperature.

Jack Helle of the NMFS laboratory at Auke Bay, Alaska is using the SST data for correlation with growth of juvenile chum salmon from Prince William Sound, Alaska. Growth of juveniles in coastal waters is faster in warm, dry summers than in cold, rainy summers. Conversely, survival of adults in spawning streams is poorer in warm, dry summers than cold, rainy ones because streamflows are lower and spawning areas of adults are more restricted.

Dr. David Blackbourn of the International Pacific Salmon Fisheries Commission finds similar effects of Fraser River sockeye salmon. Currently he is using PEG SST data to examine fluctuations in sockeye.

A number of other oceanographic organizations have obtained data from PEG for projects pertinent to fisheries problems. An example of this work is that of NOAA Geophysical Fluids Dynamics Laboratory in Princeton, N.J. which is comparing ship SST observations with similar data from orbiting satellites. This project will provide "ground truth" calibrations of satelllite data and allow us to extend our information to areas where ship traffic is sparse.

FISH COMMUNITIES INVESTIGATION

Trends in Distribution of Shortbelly Rockfish Identified

Extensive collections of shortbelly rockfish, Sebastes jordani, were made off California during February and March by the Spanish fishing vessel, Freire Lopez, with whom the Center has been cooperating on their survey cruise (see following account). Dr. William H. Lenarz, Leader of the Rockfish Analysis Task at the Tiburon Laboratory reports that members of his Task have nearly completed processing this material. Preliminary analysis of this material generally agrees with what Lenarz found in collections made during the rockfish survey of summer 1977. Considered together, these two sources of data bring into focus certain trends in the distribution of this potentially valuable California resource, and are the basis of a paper now being prepared by Lenarz and Tina Echeverria. These trends include:

1. Size and age tend to increase northward. Strong trends to this effect were evident during both years. Following this trend, the youngest (and smallest) fish taken this year were members of the 1977 year class. These dominated the collections made south of 35° N, but were relatively scarce to the north. Apparently the 1977 year class of shortbelly rockfish is exceptionally strong just as data from other sources indicate it to be a strong year class in other species, including the brown rockfish, Sebastes auriculatus, and the blue rockfish, Sebastes mystinus.

2. Size and age tend to increase with depth. Although this trend was clear in the 1977 collections, it was not apparent during this year's cruise.

3. Size at age increases northward. This trend was evident in material collected this year, but insufficient data were available on this point from the 1977 collections.

4. Latitudinal distribution of females may change seasonally. Females constituted 50 to 80 percent of the specimens collected this year south of 35° N, but only 8 to 30 percent of those collected to the north. The 1977 survey differed on this point, as in these collections there was only a slight tendency for females to be proportionally fewer northward. It may be significant that the two collections represent different seasons: The 1977 survey was in midsummer, whereas this year the collections were made in early spring. Apparently this year's collections were timed near or shortly after the peak of the spawning season. Based on examination of the ovaries, many of the females were close to spawning or spent. Possibly the sex ratios were distributed differently between those collections because the females migrate southward at the time of spawning. This is consistent with the observation that younger fish are concentrated in the southern part of the range.

Squid Research Cruise Terminated; Information Obtained on Species with Potential for Fishery Development

The Spanish vessel, Freire Lopez, terminated its squid research mission in Eureka on March 9, 1979, after completing just three weeks of a cruise scheduled for two months. Two Spanish researchers, Dr. Angel Guerra and Sr. German Perez-Gandaras, accompanied Dr. Gary Stauffer of the La Jolla Laboratory to the Tiburon Laboratory, where they worked for a week with Fishery Biologist Sus Kato on cruise reports. Although the cruise failed to uncover large resources of squid in offshore waters, information was obtained on other species with good potential for fishery development. Chief among these were shortbelly rockfish and Pacific sand dabs. Samples of shortbelly rockfish were collected and shipped to a pet food manufacturing firm which is presently researching the feasibility of using the fish in canned cat food.

Rock Crab Fishery Under Development in Bay Area

Rock crabs (Cancer spp.) have never achieved popularity in the Bay Area, presumably because the Dungeness crab is considered the market crab. Research at the Tiburon laboratory has shown, however, that sales outlets are available in local fish markets, oriental markets, and restaurants. Lt. Patrick Rutten, NOAA Officer on detail to the Tiburon Laboratory, is presently preparing a report for publication on findings to date and on the developing fishery in the Bay Area for rock crabs.

Aging Techniques for Sharks & Rays to be Validated at Tiburon Laboratory

In California, utilization of sharks and rays has increased considerably in recent years. Life history aspects of many species that comprise this emerging resource, however, are poorly understood. Elasmobranchs cannot, at present, be aged by scale and otolith readings as can certain teleosts, and though alternate techniques have been developed, relatively little is known about age and rate of growth of most California species.

During March, Fishery Biologist Susan E. Smith of the Tiburon Laboratory traveled to Moss Landing, California to meet with Dr. Leonard Compagno, Standford University, and Dr. Greg Cailliet, Moss Landing Marine Laboratories, to discuss Cailliet's upcoming Sea Grant project on elasmobranch aging and the Tiburon Laboratory's cooperative role in this study. Cailliet plans to test various techniques for reading "rings" on vertebral centra (silver nitrate impregnation, acetate peels, and X-ray spectrometry). Biologists at the Tiburon Laboratory will attempt to validate Cailliet's age determinations by injecting oxytetracycline into tagged fish to introduce a mark of known date, which, when examined on long-term recaptures of tagged fish in the wild, will serve as a time reference label in relation to variations in new centra

growth. Initially, tank tests will be conducted to determine the minimum tetracycline dose required to make a well defined mark in the centra. Tagging and injection of fish in the field should begin in June.

Plans Completed for Imprinting Experiments on King Salmon

Fishery Biologist Roger Green reported final plans for imprinting experiments on 150,000 king salmon to be conducted this year. The fish are being reared for the Tiburon Laboratory at the Feather River Fish Hatchery, Oroville, California. Daniel Ralph, Fishery Biologist, traveled to the hatchery last month to divide the fish into two groups and set up the drip apparatus to expose one-half of the fish to the artificial imprinting chemical, morpholine continually over the next several months. The fish size at the beginning of March averaged 0.3 grams when they were removed from the egg trays and placed in an outside raceway. in April or May, the fish will be inoculated against vibriosis. In June, these fish will be divided into six groups of 25,000 fish each and nose-tagged with codes distinguishing each group. On delivery at the Tiburon Laboratory in June or July, two groups of imprinted and nonimprinted fish will be immediately released as controls. The remaining four groups will be housed in two pairs of pens so that each pair consists of one group of hatchery-imprinted and one group of nonimprinted fish. One of these pairs of pens will be further exposed to the imprinting chemical with a drip system set up at the laboratory site. The other two pens will be removed well away from the drip system to avoid exposure to the artificial imprinting chemical. Plans are to rear the fish for 2-1/2 to 3 months in salt water before final release.

During the season of return in the following two or three years, morpholine drip systems to guide the fish will be set up at the laboratory pen rearing site and at Corte Madera Creek, six miles north, and will be operated alternately. Returns will be monitored by gill net, portable fish ladders or traps. It is hoped to learn the effectiveness of artificial imprinting in guiding king salmon back to harvesting areas and optimal times for their imprinting through this experiment.

PHYSIOLOGY INVESTIGATION

Results of Research on Striped Bass Presented

The third Annual Striped Bass Meeting was held at the Tiburon Laboratory, March 29, 1979. Researchers and managers from State and Federal agencies, the University of California, Davis, and San Francisco State University discussed results of their research on California striped bass. Significant results from laboratory experiments on bioenergetics and food and feeding behavior of striped bass larvae, and from intensive pathological autopsies of spawning adults were presented by the program staff. Many of the results were obtained through the cooperation of these other agencies through collecting specimens and performing analyses. Also discussed were results from California Department of Fish and Game field studies which outlines effects of drought conditions on the striped bass population.

Research objectives and plans for the upcoming experimental season were outlined for the group and cooperative efforts were coordinated. Several hypotheses have been developed which relate to the causative factors responsible for the poor condition of spawning adults. To test these hypotheses major efforts are planned to extensively sample fish from the two major river systems of the San Francisco Bay-Delta. These specimens will be autopsied and their tissues analyzed for certain pollutants. Laboratory rearing of striped bass is planned to measure egg and larval survival and growth rates. These results will be related to parental inherent conditions to estimate the extent of their effect. Oxygen consumption measurements from fertilization to metamorphosis is needed to complete the bioenergetic description of the early life stage. Understanding of the energetic processes will allow estimation of the metabolic cost of particular stresses (environmental or man-made) on the organism.

Histological studies of striped bass eggs and larvae will be expanded this year. Specimens of fed and starved larvae from laboratory reared populations will be contrasted with wild and hatchery-reared fish. The object of this subtask is to examine and compare these life stages for indicators of poor condition which can easily be applied to wild or cultured populations.

Work also continued on two papers which will be presented at the Early Life History of Fish Symposium, Woods Hole, Massachusetts, April 2-5, 1979. The papers are titled: "The effect of inherent parental factors on gamete conditions and viability in striped bass (Morone saxatilis)" by J.A. Whipple and "Endogenous energy sources as factors affecting mortality and development in striped bass eggs and larvae" by M.B. Eldridge, J.A. Whipple and E. Eng.

PACES (Pacific Area Cooperative Enforcement System) User Manual Completed

The PACES user manual was completed during March 1979. Fifty copies of the user manual were sent to the SWR for distribution to CF&G, Coast Guard, and various NMFS offices. NMFS Enforcement Management Information System (EMIS) meeting was held at the La Jolla Laboratory on March 5 thru 8.

Attendees of the meeting included representatives from the Coast Guard, NMFS headquarters and all of the five NMFS regions. PACES was presented to the EMIS group on March 7 and was well accepted according to Fred Kellenberger, Data Systems Manager. A training session for PACES was held in Long Beach, San Diego, Menlo Park and Eureka for CF&G and NMFS enforcement agents. During the training session, some changes were suggested to PACES; some were implemented immediately and others will be implemented after the system becomes operational.

David Starr Jordan Oceanographic Research Interactive Onboard Network (ORION) Computer System to be Impleted in August

The ORION system is a shipboard computer system that will be used onboard the David Starr Jordan to log scientific and navigation data, monitor sensor output for quality control and perform some data processing. The detailed specifications have been completed for the ORION computer system. The specifications will incorporate the collection and inquiry for CalCOFI, XBT, shipboard housekeeping, navigation, and tracking data. Meetings are being held with SWFC staff regarding the inclusion of Marine Mammal, STD (interface with the H.P. 9825 STD data collection), and onboard scientific analysis into the Phase I programming effort. The programming of the operating system has started. Mike Webb, at the Pacific Marine Center (PMC), is completing the programming for the CAMAC which will collect the instru-cassettes which will be used to transfer data from the ORION system to large scale computer systems. The project is on schedule and the implementation of the ORION system aboard the David Starr Jordan can be expected by early August 1979.

Progress Continues on CalCOFI Data Management System

Dorothy Roll and Rich Charter, the CalCOFI Data Manager, report that progress continues on refining the current CalCOFI Data Management System and the initial coding for the CalCOFI Historical Data System. The PRETOW prescreening program for preliminary vertification of CalCOFI net tow data is being rewritten in order to produce a program which meets new users' specifications. The new PRETOW program is being coded in standard ANSI FORTRAN IV so that for economy it can be run on the UCSD Burroughs Computer System, or even on a mini-computer system. Because standard FORTRAN lacks many of the enhanced features to be found on the Infonet system, a complete

new set of FORTRAN IV subroutines must also be produced to support PRETOW. During March, six subroutines were written and compiled for the support of PRETOW.

The internal documentation was designed for ease of understanding by other programmers. In addition, approximately one-half of the main PRETOW program is completed. Thanks to excellent cooperation from Rich Charter and Jim Thrailkill of the CalCOFI Group, the work is proceeding rapidly and the main program should be completed by the end of the first week in April.

The region codes have been redefined for the 1979 anchovy biomass analysis, primarily because the area of survey for the 1979 CalCOFI cruises was limited. A tabular report of historical data based on the newly defined regions must be generated for comparison. Based on the new region boundaries, Oden Burris is recoding the Region Pooling Program and will generate the required table of data from 1951 through 1978. Submission of this report is targeted for April 15 to allow ample time for the 1979 anchovy biomass estimate in late May.

The CalCOFI/INP Data Systems Subcommittee met on March 28, 1979 at the La Jolla Laboratory. The committee reviewed the draft copy of the CalCOFI/INP Data Dictionary. The committee will standardize data elements that are collected for the CalCOFI/INP program. Participating agencies included the California Fish and Game, Scripps, INP and SWFC.

Progress on Other Data Management Projects

Dorothy Roll, Computer Systems Analyst, began a study of the feasibility of computerizing time cards. In order to define the current manual method, she is interviewing Valerie Spowart, timekeeper.

Robert Butler, Computer Programmer, is completing and testing the programs for the SWR Market News Data Management System, which contains catch and pricing information of tunas. The software package included programs to update the files and to generate standard weekly and monthly reports.

In cooperation with the Oceanic Fisheries Resource Division, ADP Operations have been developing the data verification software for the 1979 Porpoise Observer Data Sets. The Marine Mammal Effort and Sighting edit program the last in the program series, has been tested by Bob Butler and released for final approval to Frank Ralston, Computer Specialist in the Porpoise Data Group. Butler finished his first hand drafts of the internal and external documentation of the COMMON subroutines for the data verification series. These drafts are queued for first draft typing, which will be reviewed by Dorothy Roll before submission to the Porpoise Data Group for their review. The internal and external documentations for the Cruise Specifications (CS) and the Vessel Activities (VA) edit programs have been contracted to Potomac Research Institute (PRI). Roger Grismore of PRI will begin the task in mid-April.

Progress continues also on converting the Califoria Fish & Game (CF&G) Commercial Fish Landings tapes into the format required for the Coastwide Data System (CWDS), which will contain data from California, Oregon, Washington and Alaska. Oden Burris, Computer Programmer, has coded the major part of the conversion program. This missing block to be coded is the subroutine which will scramble the vessel document number. The scrambling algorithm is to be supplied to the SWFC by CF&G. The CF&G Commercial Fish Landing tapes contain only the CF&G number for vessel identification. Before transfer to the CWDS file, these numbers must be converted to a vessel document number (the Coast Guard number of the State Marine Board number). The vessel Registration File in the Pacific Area Cooperative Enforcement System (PACES) currently contains the 1977 vessel information, which includes the CF&G number and corresponding vessel document number. Against this file, Oden will match the number from the Commercial Fish Landings tapes to retrieve the vessel document number. It is likely there will be a large number of vessels with no match with the 1977 Vessel Registration File. Resolution of the no-matches will be provided by CF&G.

MISCELLANEOUS

PUBLIC RELATIONS

Honolulu Laboratory

Reg Gooding, Fishery Biologist, spoke to an ocean policy class at Hawaii Pacific College on the Northwestern Hawaiian Islands.

The Honolulu Laboratory was host to a meeting of approximately 20-25 members of the Hawaii-Pacific Chapter of the Special Library Association on March 8. Scott Anderson, Enforcement Officer, Southwest Region, Honolulu, spoke to the group on marine mammal regulations enforcement. After the meeting, the group also visited the Laboratory library.

Tiburon Laboratory

March 31 - April 1 - Sus Kato, Lt. Patrick Rutten, and Susan E. Smith represented the National Marine Fisheries Service, Tiburon Laboratory, at the Annual Fishermen's Festival, Bodega Bay. The laboratory's booth displayed information on the king salmon salt-water rearing program, aging and growth of yellowtail rockfish, and the ecology of the offshore kelp forests. Movies were also shown on the salmon project and the predator-prey relationships of fish associated with coral reefs.

HONORS AND AWARDS

March 7 - A. Myrick, Wildlife Biologist, Cash Award; K. Bliss, Oceanographer, Cash Award; Stephanie Revesz, Biological Aid, Cash Award; Ronald Dotson, Biological Technician, Cash Award; Ronald Lynn, Oceanographer, Cash Award; Makoto Kimura, Fishery Biologist, Cash Award; Priscilla Sloan, Biological Technician, Quality Step Increase.

28 - David Mackett, Program and Planning Officer, Cash Award.

30 - Director Norman J. Abramsom of Tiburon Laboratory has been reappointed to serve on the Educational Advisory Committee to assist in the evaluation and assessment of Marine Environmental Technology, Marin Community College District, for the coming year.

- Fishery Biologist James Thrailkill, La Jolla Laboratory-30 year length of service award.

- Biological Technician Elizabeth Stevens, La Jolla Laboratory - 15 year length of service award.

- Communications Specialist Mark Sweeney, La Jolla Laboratory - 15 year length of service award.

SEMINARS

La Jolla Laboratory

March 8 - Joseph Thompson, Seavision Productions, presented a special preview of the film, "Voyage of a Yankee Tuna Clipper." This film was subsequently shown on national television.

12 - Dr. Ronald Schlitz, Northeast Fisheries Center, Woods Hole, Massachusetts, discussed, "An international larval herring patch study on Georges Bank."

14 - Jerry Witzel, Chief, Employee Services, NASO, presented a talk for all employees on the New Civil Service Reform Act.

15 - Harold Temmer, Assistant Vice Chancellor, University of California, San Diego, presented a talk on "Management techniques, concepts, and practices. Mr. Temmer's lecture was one in the series of supervisory seminars at the Center.

20 - Sargun Tont, Staff Research Associate, Scripps Institution of Oceanography discussed, "Man and the sea: A case study in cultural ecology." Tont explained his presentation as a humanistic view of the impacts of mythology, history and literature on value concepts of the oceans and its inhabitants.

23 - Arnulv Borud and Raymond Brede, Fishery Division, Simrad Corporation, Horten, Norway, discussed acoustic instruments for fisheries research with particular emphasis on scientific echo sounders, echo integrators: analog and digital, towed transducers, sonar situation display, and deep water pelagic trawling.

Tiburon Laboratory

March 23 - The first joint seminar series with San Francisco State University was held at the Tiburon Laboratory. The seminar was presented by Distinguished Visiting Scientist, Hal Markowitz, Department of Biology, San Francisco State University, and entitled: "Some captive studies of learning in the harbor seal."

VISITORS

Honolulu Laboratory

February 27 - Mr. Charles Yamamoto on Marine Fisheries Advisory Committee (MAFAC) matters; Mr. & Mrs. Brian Johnson regarding the Hawaii Fisheries Development Plan.

March 5 - Mr. & Mrs. Brian Johnson visited Shomura to discuss their 1979 research proposal on Hawaiian monk seal at Laysan Island.

5-7 - David Mackett, Planning Officer, SWFC, visited and worked with Mr. Otsu and Dr. Skillman on Honolulu Laboratory's CYTP and other related matters.

6 - Henry A. Hansen, Hawaii Administrator, U.S. Fish and Wildlife Service, visited Shomura to introduce Mr. Dael Coggeshall who will be the new administrator upon Mr. Hansen's retirement in late April 1979.

- Dr. Virginia Aprieto, University of the Philippines, College of Fisheries, Quezon City, and presently a Fellow at the Environment and Policy Institute, East West Center, met with Shomura and Drs. Skillman and Wetherall to discuss the background work she is preparing on the tuna resources in the Philippine area.

- Mr. Peter Walczak, UNDP/FAO, P.O. Box 276, Bikenibeu, Tarawa, Gilbert Islands.

12 - Jack Wise, Fx54 (Evaluation Staff, Office of Policy and Planning, NMFS, Washington, D.C.), visited Acting Laboratory Director T. Otsu.

19 - Robert Schlesser and Guy Rothwell of Oceanic Institute visited Acting Director Otsu to request assistance in obtaining live mahimahi for their spawning and culture work.

20 - Mr. Henry Sesepasara of American Samoa visited and met with Messrs. Shomura, Otsu, Uchida, and Matsumoto to discuss the American Samoa fish aggregating project.

22 - Mr. M.P. Shepard, Commonwealth House, London, England, visited the Laboratory for discussions with Acting Laboratory Director Otsu and Librarian Nishimura. Shepard was en route home from the South Pacific.

23 - Dr. Ted Rice, Laboratory Director, NMFS Biological Laboratory, Beaufort, North Carolina, and Mrs. Rice visited Acting Director Otsu.

26 - Masanori Kawaguchi, who was provided a letter of introduction by Mr. W.A. Wilkinson, Fisheries Officer in Tonga, visited Acting Director Otsu. Kawaguchi, a marine biologist working under Japan's Overseas Cooperation Volunteer Service, was en route to Pago Pago to review the mollie project.

- Dick Okada of M. Okada and Company visited Otsu to discuss longline fishing. Okada is considering the construction of a longliner.

- Dr. Tom Rohlen, University of California, Santa Cruz, visited Mr. Otsu.

La Jolla Laboratory

March 1 - Paul Sund, Pacific Environmental Group, Monterey

- Charles M. Stoehte, NOAA, Washington, D.C.

7 - LCDR William Hubor and Lt. Tom Worley, U.S. Coast Guard, San Francisco, CA.

8 - LCDR Bob Blancutt, Ltjg. Becky Code, Ronald Shemansky, and Colin Campbell, Naval Weather Service Facility, Naval Air Station, North Island.

- Paul R. Kelly, California Department of Fish and Game, Long Beach, CA.

14 - Henry R. Frey and Tom Mero, NOAA, National Ocean Service, Rockville, MD.

19 - Dr. Bruce Mate, Oregon State University, Newport, Oregon.

- Drs. Aprilani Soegiarto, Director, National Institute of Oceanography and Chairman, Indonesian Committee on Marine Research and Dr. Johanees M. Nanlohy, Fishery Technologist Representative, Pattimura University, Jakarta, Indonesia.

20 - Mr. Neal B. Thayer, Humboldt State University, Eureka, CA.

21-22 - Dr. Richard Parrish, PEG, Monterey, CA.

26 - Dr. Dayton L. Alverson, Director, Northwest and Alaska Fisheries Center.

26-27 - Dr. Phyllis Kahn, National Science Foundation staff member responsible for reviewing porpoise/tuna research to meet with Director Barrett, and Drs. Lasker, Hunter, Sakagawa, Perrin, and Stuntz.

28 - Dr. Stig Streslet, Nordland Reginal College, Norway.

Pacific Environmental Group

March 21 - Lt. William D. Otto, NOAA, ERL, Boulder, CO.

27 - Mr. Louis Pitt, EDIS, Washington, D.C.

29 - Mr. Nelson Ross, EDIS, La Jolla, CA.

Tiburon Laboratory

March 1 - Jim Wilson, University of Alaska, Fairbanks, AK.

2 - John B. Hewey, U.S. Fish and Wildlife Service, Sacramento, CA.

- Thomas A. Tough, Central California Fruit Growers, Wheatland, CA.

- William T. Davoren, U.S Fish and Wildlife Service, San Francisco, CA.

6 - John A. Calder, NOAA/OCSEAP, Boulder, CO.

10 - Adam Moles, National Marine Fisheries Service, Auke Bay, AK.

13 - Ken Schmidt, Western Regional Engineer, NOAA, Seattle, WA.

14 - Denise O'Dunkle, Genealogy Department, University of California, Berkeley, CA.

- Hiroyuki Egunchi, Yokohama, Japan

- Sr. German Perez-Gandaras, Instituto de Investigaciones Pesqueras, Vigo, Spain

- Dr. Angel Guerra, Instituto de Investigaciones Pesqueras, Vigo Spain

- Theodore Steiner, Psychology Department, San Francisco State University, San Francisco, CA.

20 - Gerald Roehn, USFWS, Honolulu, HI.

21 - Richard Simpson, San Francisco State University, San Francisco, CA.

23 - Warren Freihafer, San Francisco State University, Tiburon Center for Environmental Studies, Tiburon, CA.

- Holly Garner, California Marine Mammal Center, Fort Cronkhite, CA.

- Don Griffin, California Marine Mammal Center, Fort Cronkhite, CA.

- Hal Markowitz, Department of Biology, San Francisco, State University, San Francisco, CA.

- Dwight W. Taylor, San Francisco State University, Tiburon Center for Environmental Studies, Tiburon, CA.

24 - Dr. Boguslaw Lubieniecki, Sea Fisheries Institute, Gdynia, Poland.

- Miroslaw Zawadski, Sea Fisheries Institute, Gdynia, Poland

26 - Mike Morford, National Marine Fisheries Service, NOAA, Washington, D.C.

27 - Monica Grady, Williams College, Williamstown, MA.

- R. Tolbert, Renewable Energy Systems, Marin City, CA.

- Catherine C. Vare, Williams College, Williamstown, MA.

29 - Harold Chadwick, Department of Fish and Game, Stockton, CA.

- Phil Flint, Department of Fish and Game, Rancho Cordova, CA.

- Bellory Fong, Department of Water Resources, Sacramento, CA.

- Marvin Jung, State Water Resources Control Board, Sacramento, CA.

- Marty Kjelson, U.S. Fish and Wildlife Service, Stockton, CA.

- David W. Kohlhurst, Department of Fish and Game, Stockton, CA.

- M.L. McCormack, Department of Fish and Game, Elk Grove, CA.

- Lee Miller, Department of Fish and Game, Stockton, CA.

- Keniset Morre, Department of Water Resources, Sacramento, CA.

- J. Gary Smith, National Marine Fisheries Service, Southwest Region, Terminal Island, CA.

- Don Stevens, Department of Fish and Game, Stockton, CA.

- Ross Sweneston, State Water Resources Control Board, Sacramento, CA.

- Toru Taniuchi, Department of Fisheries, University of Tokyo, Tokyo, Japan

MEETINGS AND TRAVEL

Honolulu Laboratory

February 24 - Richard Shomura, Director of the Honolulu Laboratory, participated in an all day (Saturday) Community Workshop, "The absence of the ocean in the workday life of the Pacific Island people," at the Leeward Community College. The workshop was sponsored by the Waianae Hawaiian Heritage Cultural Center, the Sea Grant College, Leeward Community College, and the Hawaii Committee for the Humanities.

March 1 - Shomura attended a meeting of the Billfish Planning Team and the Advisory Subpanel meeting called by the Western Pacific Regional Fishery Management Council (WPRFMC) in the Honolulu Laboratory conference room.

7 - Shomura called a meeting attended by Honolulu Laboratory and University of Hawaii staff members to discuss project proposals dealing with studies on the economic potentials of fishery development in the NWHI. Honolulu Laboratory staff at the meeting included Drs. M. Adams, R. Mendelssohn, and R. Skillman and Messrs. R. Uchida and H. Yuen; Dr. J. Davidson, Sea Grant, and Dr. S. Comitini, Economics Department, attended from the University.

8-9 - Shomura and Center Director Barrett attended the 12th Scientific and Statistical Committee meeting of the WPRFMC at the Ala Moana Hotel.

10-16 - Shomura traveled to the western Pacific to: 1) meet with Fisheries Officers and District Administrators regarding Pacific Tuna Development Foundation/NMFS fishery programs in Koror (March 11-12); 2) attended the WPRFMC meeting and joint public hearing on precious coral draft environmental impact statement/fishery management plan in Saipan (March 13-14); and 3) attend similar meetings in Guam (March 15).

19 - Reginald Gooding represented Shomura at a meeting attended by Western Pacific Program Office, Southwest Region personnel and Dr. Robert Knecht and Ms. Joanne Chandler of Coastal Zone Management to discuss a marine sanctuary for humpback whales in waters near Maui.

21-23 - Shomura traveled to La Jolla to attend the Tuna Research Workshop at the Southwest Fisheries Center with Center officials and to present the FY 81 Townsend Cromwell cruise schedule.

30 - Hazel Nishimura, Librarian, attended the Annual Spring Conference of the Hawaii Library Association at the Princess Kaiulani Hotel.

La Jolla Laboratory

February 25 - March 1 - Planning Officer D. Mackett traveled to Washington, D.C. to attend planning meetings and the Recreational Fisheries Workshop.

February 26 - March 2 - Dr. Gary Stauffer was in Beaufort, North Carolina to participate in menhaden assessment meetings.

February 28 - March 1 - Director I. Barrett traveled to Monterey, California to discuss scientific and administrative matters with Chief, Pacific Environmental Group and his staff.

4-8 - Mackett was at the Honolulu Laboratory for a program planning meeting.

4-9 - Sakagawa traveled to Miami to attend a meeting in preparation for International Commission for the Conservation of Atlantic Tunas meeting and to attend meetings concerning the renegotiation of the Inter-American Tropical Tuna Commission.

4-10 - Dr. W. Perrin was in Tokyo, Japan to participate in a meeting to review results of the Dall's porpoise research and to formulate plans for a research program in 1979-80.

6 - Huppert, MacCall and McMillan met with Jack Mackerel Plan and Anchovy Advisory subpanel in Long Beach.

6-10 - Barrett in Seattle to attend a Senior Executive Service Workshop and on to Honolulu to attend the SSC meeting of the Western Pacific Fisheries Management Council.

7-9 - D. Huppert was in Eureka, California to attend the Statistical and Scientific Committee (SSC) meeting and the Pacific Fisheries Management Council deliberations.

7-14 - Stauffer in Eureka to meet Spanish trawler Freire-Lopez, report to PFMC on the research cruise, and travel to Tiburon with Spanish scientists for workshop (with S. Kato) to write up results of squid cruise.

8-14 - Dr. T. Smith, Fishery Biologist traveled to Honolulu and then on to Saipan, Mariana Islands to meet with the SSC and the WPFMC to present the final version of the spiny lobster management plan with which he had been involved since its inception.

18-28 - Fishery Biologist J. Jennings traveled to Oxford, England to attend the International Conference on Telemetry and Radio Tracking in Biology and Medicine and to Toulouse, France to attend the Users' meeting on the TIROS/ARGOS Satellite Tracking System.

24-29 - Deputy Director J. Carr traveled to East Lansing, Michigan as a member of the Site Review Team for the Michigan Sea Grant program.

26-29 - Mackett was in Washington, D.C. to attend a Planning System Design meeting.

Pacific Environmental Group

March 1-2 - Paul Sund traveled to La Jolla to obtain data on tuna distributions for manuscript.

14 - Andrew Bakun, David Husby and Richard Parrish traveled to Redwood City to consult with NESS personnel concerning Remote Sensing for fisheries.

19-20 - Richard Parrish and Donna Mallicoate traveled to Long Beach to discuss cooperative research with California Department of Fish and Game personnel.

21-11 - Richard Parrish continued on to La Jolla from Long Beach to further discuss cooperative research projects with SWFC personnel.

Tiburon Laboratory

February 26 - March 2 - Dr. Edmund S. Hobson attended the NOAA Diving Safety Board Meeting at the Southwest Fisheries Center, La Jolla.

5-7 - Dr. Jeannette A. Whipple traveled to Seattle, Washington, to attend the National Microconstituents Task Board of Advisors Meeting.

6-9 - Dr. William H. Lenarz traveled to Fort Bragg and Eureka to attend the Groundfish Team/Advisory Panel Joint Meeting, and discuss research on widow rockfish with representatives of the California Department of Fish and Game.

- Ed Ueber traveled to Fort Bragg and Eureka to meet with personnel of the California Department of Fish and Game, and to attend meetings of the Groundfish and Dungeness Crab Management Planning Teams of the Pacific Fishery Management Council.

- Sus Kato also traveled to Fort Bragg and Eureka to pick up specimens collected by the Spanish research vessel, Freire Lopez.

8 & 30 - Abramson met with Dr. Erwin Seibel, Director, San Francisco State Universtiy, Tiburon Center for Environmental Studies, to discuss cooperative activities.

15 - Dr. Edmund S. Hobson traveled to Sacramento to participate in the State of California Sea Otter Scientific Advisory Board meeting.

23 - Ed Ueber traveled to Portland, Oregon to attend a meeting of the Pacific Fishery Management Council ad hoc Economic Panel. The panel selected a potential contractor to undertake a study on, "Data acquisition for determination of market channels, price trends and consumer demand for West Coast groundfish, Dungeness crab, and pink shrimp."

TRAINING

March 15 - Maureen Woods, Librarian at the Tiburon Laboratory, Refresher Course in ERS (Bibliographic Retrieval Service) Data Base Access System. BRS Training, Oakland, CA.

PERSONNEL

March 5 - Dorothy J. Ruse, Clerk-Stenographer, Appointment - Tiburon Laboratory.

14 - Constance Ryan, Biological Aid, Resignation - Tiburon Laboratory.

20 - Patrice Murphy, Writer/Editor, Resignation - La Jolla Laboratory.

22 - Robert Pitman, Biological Technician, Resignation - La Jolla Laboratory.

23 - Gary Friedrichsen, Biological Technician, Resignation - La Jolla Laboratory.

25 - Richard Charter, Data Manager, Promotion - La Jolla Laboratory.

- Edward Ueber, Industry Economist, Promotion - Tiburon Laboratory.

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